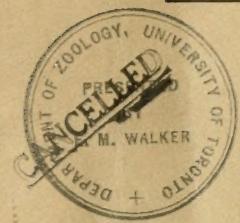


P
Bio
J

PROPERTY
OF
TORONTO BRANCH
ENTOMOLOGICAL SOCIETY
OF ONTARIO
No. 19.3.281.

VOLUME ELEVEN

NUMBER ONE



JOURNAL OF ENTOMOLOGY AND ZOOLOGY

MARCH, 1919

PUBLISHED QUARTERLY BY
POMONA COLLEGE DEPARTMENT *of* ZOOLOGY
CLAREMONT, CALIFORNIA, U. S. A.

CONTENTS

	Page
NEW POLYCHAETOUS ANNELIDS FROM LAGUNA BEACH, CAL.— <i>Ralph V. Chamberlin</i>	1
THE NERVOUS SYSTEM OF CAECUM CALIFORNICUM— <i>W. A. Hilton</i>	24
AMPHIPODS FROM LAGUNA BEACH.....	26

Journal of Entomology and Zoology

EDITED BY POMONA COLLEGE, DEPARTMENT OF ZOOLOGY

Subscription \$1.00 to domestic, \$1.25 to foreign countries.

This journal is especially offered in exchange for zoological and entomological journals, proceedings, transactions, reports of societies, museums, laboratories and expeditions.

The pages of the journal are especially open to western entomologists and zoologists. Notes and papers relating to western and Californian forms and conditions are particularly desired, but short morphological, systematic or economic studies from any locality will be considered for publication.

Manuscripts submitted should be typewritten on one side of paper about 8 by 11 inches. Foot notes, tables, explanations of figures, etc., should be written on separate sheets. Foot notes and figures should be numbered consecutively throughout. The desired position of foot notes and figures should be clearly indicated in the manuscript.

Figures should be drawn so that they may be reproduced as line cuts so far as possible. An unusually large number of half tones must be paid for in part by the author. Other more expensive illustrations will be furnished at cost. Figures for cuts should be made to conform to the size of the page when reduced, that is, 5 by 7½ inches or less. The lettering should be by means of printed numbers and letters pasted on the drawings, in most cases.

Authors of articles longer than a thousand words will receive fifty reprints of their publications free of cost. If more than this are desired, the order should be given with the return of the proof sheets. Extra copies and special covers or special paper will be furnished at cost. Authors of short contributions will receive a few extra copies of the number containing their articles.

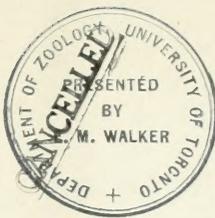
Manuscripts should be sent by express or registered mail.

Address all communications to

THE JOURNAL OF ENTOMOLOGY AND ZOOLOGY

William A. Hilton, Editor

Claremont, California, U. S. A.



New Polychaetous Annelids From Laguna Beach, California

RALPH V. CHAMBERLIN

In a very interesting collection of annelids from Laguna Beach transmitted to me for study by Prof. Hilton, the apparently previously undescribed forms listed below are represented. As a comprehensive report on the annelids of the region to follow further explorations and collecting is in contemplation, I am giving here only such preliminary accounts of the new forms as are thought sufficient for their identification in the local fauna. The types of all these species are in the Museum of Comparative Zoology at Cambridge.

POLYNOIDAE

Halosydnia latior sp. nov.

A species proportionately broader over all than the usual forms of the common *H. insignis*, *californica*, and *pulchra*. It is characterized by elytra not only closely imbricated along each side but also broadly overlapping in the middle line throughout the length. The elytra in general are unusually elongate in an oblique direction, the long axis running from the outer end cephalomesad; the outline subelliptic, the caudomesal edge broadly convex, the opposite one a little incurved at middle. The entire surface of elytra subdensely covered with very small rounded brown nodules or tubercles; within the middle region, just behind the edge of the preceding overlapping elytron, a number of much larger paler tubercles which in the type are present on all excepting the last pair. Elytra extending to outer ends of parapodia. Eighteen pairs of elytra present. Prostomium subangularly bulging on each side, the anterior eye at the angle, the posterior eye removed far caudad, by about half the greatest width of the prostomium. Paired anterior prolongations of the prostomium very long, as long as the median length of the prostomium back to level of posterior eyes, distally clavate. Median ceratophore much stouter than the lateral prolongations and exceeding them by more than a third in length. Median tentacle long, nearly attaining end of palpi; slender, narrowing distad, only slightly thickened subapically, with the usual slender tip which is of moderate length. Lateral tentacles much shorter, their tips reaching only to near middle of light region between proximal black region and subapical black ring of median tentacle. Tentacular cirri resembling median tentacle in form, being narrowed distad with subapical enlargement slight; one or two fine setae emerging from a small nodule at distal end of parapodium proximad of tentacular cirrus. The notocirri in general have the same characteristic form as the tentacular cirri, narrowing continuously distad with the subapical enlargement slight. First neurocirrus very elongate, surpassing the parapodium. The other neurocirri slenderly cylindroconical, narrowed into a slender tip and a little narrowed proximally; attached well toward base of parapodium the end of which they fail much of attaining. A characteristic feature is the elongate form of the nephridial papillae, these in the type as preserved being mostly near three times as long as thick at the middle. Neuropodial setae dark amber colored, numerous, arranged in two continuous regions, a narrow dorsal one and a much broader ventral one in the latter of which the setae form four distinct longitudinal series with five or six setae in each series. Notopodials moderate in

number, the dorsal ones short, the most ventral long, attaining the end of the neuropodium. The elytra are greyish with dusky or brownish mottlings. Notocirri with dark annulations as usual.

Length, 42 mm.; width to end of setae, 14 mm.; to end of parapodia, 10.8 mm.; exclusive of parapodia, 7 mm.

Taken on Laguna Beach at Mussel Point (Hamilton coll.).

Type—M. C. Z. 2, 138.

Halosydnæ tuberculifer sp. nov.

Among other forms known from the California coast characterized especially by the strong tuberculation of all the elytra. The tubercles are mostly large and conical though some are rounded and are confined chiefly to the mesocaudal half and median region of each elytron, a series of large ones ordinarily present along the caudal and caudomesal margin; in the first two or three pairs of elytra the tubercles of the median region especially large, the tubercles on the first pair occurring on the anterior part as well; ectal margin of elytra strongly fringed or ciliate. Elytra in general subcircular but with margin of ectocephalic side flattened or in part a little incurved. Elytra in contact or nearly so at median line but not there at all overlapping. Pairs of elytra eighteen, these being present on somites II, IV, V, VII, IX and so on alternate ones to XXV and then on XXVI, XXVIII, XXX, XXXI, and XXXIII. The last three setigerous somites bear notocirri. Anterior pair of eyes near middle of length of prostomium proper, larger than posterior pair which are a little closer together and are well removed from the others. Lateral prolongations of the prostomium in front which bear the lateral tentacles only a little shorter than the median ceratophore though much more slender. Median tentacle shorter than the palpi, moderately enlarged and strongly rounded subapically and with the usual slender tip or filament which is comparatively short. The lateral tentacles of similar form but much shorter and more slender. Neurocirri of first normal segment large, resembling a notocirrus. The other neurocirri much shorter, subconical, constricted at base and prolonged into a slender but short tip; attached near base of neuropodium in each case. Anal cirri similar to notocirri but much longer and stouter. Neuropodial setae of usual general form, amber colored with dark tip, arranged mostly in two or three, usually uneven, subvertical series. The notopodial setae fine, numerous, the longer ones not falling much short of or reaching the ends of the neuropodials. The nephridial papillæ occupy the ordinary position; they are small and unusually short. The color of the elytra uniform greyish brown. Antennæ, tentacular cirri and notocirri banded at base and distally with black.

Length, 23 mm.; width exclusive of parapodia, 3 mm. A little narrowed cephalad, somewhat more so caudal.

Taken at Laguna Beach under stones. (1917)

Type—M. C. Z. 2, 139.

Halosydnæ leioseta sp. nov.

Body strongly and continuously narrowed caudad. Prostomium wider than long, deeply bilobed, the median tentacle inserted deeply in the intervening incision. Lobes extended forward into peaks which, however, are constricted at base so as to give appearance of more or less distinct ceratophores, these short. Anterior eye free on each side, the caudal one much farther mesad and overlapped by the peristomium. Tentacles short, the median line a little longest and about equalling the palpi; in

each a slender tip above the moderate subdistal swelling about equal in length to the remaining part of the style. Tentacular cirri similarly formed, as is also the first neurocirrus, the latter less clavate below the slender tip. Other neurocirri much shorter, shortly subfusiform with filiform tip short; characteristically inserted almost precisely at middle of length of the neuropodium. Notopodia reduced to small lobes at base of neuropodia above, these lobes smooth, bearing no emergent setae in the type. In the average neuropodium the setae are mostly six in number; these are coarse, with subhastate heads the tips of which are curved, entire, and acute; the surface appears smooth, the seriate spinules being exceedingly minute and easily overlooked; pale straw colored. The notocirri have the usual enlarged distal end baring a slender tip and a little exceed the neuropodial setae. The elytra have an arrangement in general similar to that normal in *Halosydna* so far as that usually goes, but twenty-four pairs are present, these occurring on somites, II, IV, V, VII, IX, XI, XIII, XV, XVII, XIX, XXI, XXIII, and XXVI, XXVIII, XXIX, XXXI, XXXIII, XXXV, XXXVII, XXXIX, XLI, XLIII, XLV, and XLVII. The elytra are characteristically widely imbricated so as completely to cover the dorsum and prostomium. They extend out far laterally so as wholly to overlap the parapodia proper though the ends of the setae and notocirri extend beyond the edges. The elytra have the surface wholly smooth and the edges are also not fringed. As preserved, the type has no definite color markings; color greyish, the elytra of weak fulvous cast.

Length near 22 mm.; greatest width exclusive of parapodia, 2.8 mm.; to ends of parapodia, 5 mm.; to ends of setae, 6.8 mm.

Taken as a commensal on a sea-urchin (Metz, July 20, 1911).

Type—M. C. Z. 2, 140.

Lepidonotus setosior sp. nov.

Readily distinguished from *L. squamatus*, *coeloris* and other species recorded from the Pacific coasts of North and South America by the greater length and coarseness of the notopodial setae, these being stout pointed spines often nearly attaining the ends of the neuropodials and thus exceeding the latter in actual length. The notopodials, however, are obviously more slender than the neuropodials; they are much more numerous than the neuropodials and form a dense, subcylindrical, spreading group. The elytra are characterized by bearing over their free portions numerous high and stout, conical, hard or chitinous tubercles which are, however, much less dense than the very different rounded eminences of *squamatus*, these cones often roughened; between these high cones, and over the covered part of the elytra as well, numerous small rounded tubercles or nodules; much more slender and shorter, erect, conical papillae present on the outer border of at least some of the elytra but no truly ciliate fringe could be detected in the types. The elytra are long, subelliptic in outline, and are arranged either with axis nearly longitudinal or very oblique, the most anterior elytra, however, subcircular. Eyes on each side unusually widely separated, the anterior one low on side, a little ectocaudad of base of anterior process. Anterior processes of prostomium about four-fifths as long as the median ceratophore and much more slender. Lateral tentacles much more slender than the median, and, exclusive of the filamentous tip, falling short of attaining the middle of the style of the latter exclusive of its tip; styles biannulate with black as frequent, the basal process also black. Median tentacle surpassing palpi in length; subapical swelling pronounced, much more so than that of the laterals. Tentacular cirri and notocirri similar in form to

the median tentacle. Anal cirri proportionately somewhat shorter than in *squamatus*. Color of venter and parapodia grey; elytra at present grey over a fulvous ground. Setae dark amber to nearly ferruginous, darker than usual in *squamatus*. A paratype has elytra fulvous of dilute ferruginous cast with black mottlings.

Length, 18 mm.

Type—M. C. Z. 2, 141.

Lepidonotus leius sp. nov.

A species characterized by its rather thin, easily detached elytra which have their surface wholly smooth or, at most, showing a few scattered minute points; closely fringed along the outer margin, about the cephaloectal region, and for a short distance along the anterior edge. Elytrophore attached cephaloectad of middle. Anterior and ectal margins of a typical elytron only weakly convex, the cephaloectal corner subrectangular though rounded; caudal margin strongly convex, the inner end of elytron like the end of an ellipse but with lower margin the more oblique. Elytra transverse or but little oblique, strongly overlapping in the middorsal line. Prostomium of usual general form. Eyes large and black, the anterior ones near middle of main region of prostomium, the posterior ones closer together and at caudal end. Only one tentacle, a lateral, retained in type. This characterized by a short cylindrical style which to the base of the distal swelling is scarcely longer than the basal process, and especially by an unusually long slender tip which is as long as the rest of the style. The parapodium of the first segment bears two prominent setae in the usual position; tentacular cirri of usual form, the filiform tips long, when bent back reaching proximad of middle of style. Notocirri also characterized by their long terminal filaments. Neuropodial setae light amber-colored; arranged in the usual vertically elongate patch, presenting a narrow dorsal half and a broader ventral one. In the ventral part of the patch normally four longitudinal rows of three setae each, while the narrower upper region shows also about four rows but with only two or one in each. The setae have the usual general structure. Notopodials numerous, reaching beyond distal end of neuropodia and sometimes nearly to middle of the neuropodial setae. In the type the elytra are light brown. The tentacles and notocirri ringed with black as common.

Length, 13 mm.; width exclusive of parapodia, 3 mm.; width to tips of setae, 6 mm.

Dredged.

Type—M. C. Z. 2, 142.

PHYLLODOCIDAE

Hesperophyllum gen. nov.

Similar in general to *Notophyllum* and *Austrophylidium* but differing especially in having the ventral cirrus of the second segment flattened and foliaceous and strongly asymmetrical. It is like *Notophyllum* and unlike *Austrophylidium* in having the first segment dorsally reduced.

Genotype.—*H. tectum* sp. nov.

Hesperophyllum tectum sp. nov.

The first segment dorsally reduced. Ventral tentacular cirrus of second somite of a thin or foliaceous and asymmetrical form. Other tentacular cirri subcylindrical, reduced distally to a pointed tip, that of I about half as long as the dorsals of II

and III. Paired tentacles short, proximally thick and convexly bulging, abruptly narrowed to an acute tip with incurving sides. Unpaired tentacle situated between eyes in line connecting their centers, nearly of same length and size as the first tentacular cirri and about as long also as prostomium; annulate. Prostomium shortly subcordate, well rounded in front, incurved caudally. With very large cirri of which the dorsals widely overlap in the middle and thus completely cover the dorsum, the prostomium normally also being wholly concealed from above. The neurocirrus of a typical parapodium is attached by a broad base extending from a pronounced ventral swelling or flange (neurocirrophore) across the caudal side of the parapodium to its dorsal edge and projects farther dorsad of the parapodium than ventrad, the dorsomesal end widely rounded; much broader dorsoventrally than long, with the free edge evenly rounded. The notocirrophore in a thick rounded body arising from the base of the parapodium proper and showing the notopodium as a proportionately much smaller lobe on its ectal side; the style is attached about its caudal half-circumference and is broadly subreniform with the free margin coarsely crenulate or wavy, its mesal limb widely overlapping that of the opposite notocirrus and its ectal one overlapping the neurocirrus. Surface of cirri and of somites, especially ventrally, densely covered with very fine brown dots or points. Number of segments in type, near seventy-three. Body narrowing caudad, becoming narrow and pointed at posterior end. Proboscis unknown.

Length, 19 mm.

Type—M. C. Z. 2, 143.

Dredged. Brown in life, this color being also retained in the preserved type specimen. A paratype has a greenish cast. This species suggests *Notophyllum imbricatum* Moore in the large imbricated notocirri covering the dorsum but in the latter all the tentacular cirri are of the elongate, symmetrical, evenly tapering form characteristic of its genus. *Imbricatum* similarly presents nuchal appendages, but these are three in number on each side and slender, instead of two broad, subelliptic lobes. The neuropodium is distally narrowed instead of broad, the head is differently formed, and various other differences are present throughout.

Steggoa gracilior sp. nov.

This is a small and slender form noted as green in life and also retaining this color after preservation in alcohol. It agrees in general with *Steggoa*, the first segment being normally developed above and distinct from the prostomium though not so clearly separated as usual, suggesting a tendency toward the *Hypoeulalia* condition. Prostomium a little longer than wide, narrowed anteriorly, sides convex; a short lobe, rounded in front and bearing the four tentacles, is set off by a weak constriction from the basal part. Unpaired tentacle situated well caudad, more slender than the paired ones but nearly as long. Eyes not detected. Ventral tentacular cirrus of II of a thick, leaf-shaped form, sublanceolate in outline and much like the notocirri. The other tentacular cirri longer and filiform. Notocirri in outline lanceolate, characteristically exceptionally thick in proportion to width so as at times to appear nearly subconical. Neurocirri much smaller; similarly proportionately thick and at times subconical. Body slender, strongly narrowed from the middle toward both ends. The

proboscis densely and uniformly papillose throughout. Number of segments near one hundred and twenty-three.

Length, about 26 mm.

Type—M. C. Z. 2, 144.

Sige californiensis sp. nov.

Corresponding closely in general characters with *S. macroceros* (Grube), the genotype. Green in color instead of straw-yellow to brown. Tentacles long and slender as in *macroceros*, with the median equalling the others in length and inserted close to the base of the latter; tips of tentacles slenderly attenuated. The eyes seem to be proportionately larger than in *macroceros*. The first segment is reduced above at the sides where the prostomium bulges back on each side; but the middle region is well developed, extending forward on the base of the head as a rounded lobe or flap. Very easily distinguished from *macroceros* and other known species by the form of the ventral tentacular cirrus of the second segment which, in place of the ordinarily lanceolate foliaceous form, is very strongly expanded above the base, presenting a large rounded lobe in front and an abruptly much more slender tip, with the blade as a whole irregularly twisted. The parapodia very similar to those of the genotype; but the setigerous lobe less acutely and less deeply notched and rather broader across the end along the setigerous line. The notocirri rather more slender and narrowed more evenly distally, not incurved on each side distally so as to leave an elongate tip set off from the rest. The neurocirri similar but more asymmetrical, the upper margin straight or concave, the lower convex. Anal cirri missing. Proboscis not protruded. Total number of segments in the type, which is complete, sixty-eight.

Length, 10 mm.

Type—M. C. Z. 2, 145.

Taken under stones.

Moore has described *Eulalia* (*Sige*) *bifoliata* from Monterey Bay; but as the ventral tentacular cirrus of II is described and figured as cylindroconical, that species cannot be properly referred to *Sige* as now restricted.

Anaitides heterocirrus sp. nov.

Close to *A. mucosa* (Oersted) in the characters of the proboscis, having similarly six rows of papillae proximally on each side with the number in each series normally nine or ten, but distinct in the form of the cirri. The three first pairs of normal foliaceous notocirri much smaller than the succeeding ones and different in shape, being very broadly and evenly elliptic, the distal end of the third, e. g., broadly rounded, not conspicuously narrowed as in *mucosa*. In the average parapodia of the middle region of the body the neurocirri are obviously broader with the tip stouter and less acute; and the notocirri, while in general somewhat similar in form, are more elongate with a more pronounced ventral lobe, the distoectal angle more acute and more produced, while the distomesal corner is more rounded, and the proportionate width across the distal end appears less. The prostomium very broadly cordate, notched or constricted at the sides near the anterior third which is distally broadly rounded; tentacles inserted on each side at or just distad of the constriction, conical and of moderate length; caudal margin conspicuously angularly incised at middle and there embracing a conspicuous nuchal papilla. Eyes about twice their diameter apart. The type is incomplete caudally, at present consisting of ninety-five somites and having a length

of 35 mm. with a maximum width, exclusive of parapodia, of 2 mm. The body at present has a purplish tinge.

Dredged at 10 fathoms on Aug. 27, 1917.

Type—M. C. Z. 2, 146.

SYLLIDAE

Typosyllis bella sp. nov.

Differing from *armillaris* (Müller), *alternata* (Moore) and related forms in the form and relations of the prostomium and its appendages. The prostomium is broadest anteriorly, narrowing caudad and rounded forward a little at middle in front. A characteristic feature is that the three tentacles are in a transverse line along the anterior edge, the median being thus inserted far in advance of the posterior eyes. A median longitudinal furrow extending forward from caudal edge to base of median tentacle. The anterior eyes much larger than the posterior and farther apart, each somewhat transversely elliptic and located far forward at base of lateral tentacle on its ectal side. The median tentacle about two and a half times longer than the prostomium; in the type composed of twenty-one articles; only a little narrowing over the distal region. Lateral tentacles considerably shorter than the median. Inferior tentacular cirrus about equal in length to the median tentacle, the upper one much longer and consisting of about thirty-four articles. Neurocirri slender, subcylindric, somewhat conical distally or sometimes a little clavate, surpassing end of parapodium. Notocirri in anterior region alternating in length, the long ones surpassing the width of the body proper and consisting of about thirty-two articles while the short ones embrace only near eighteen. Notocirri becoming shorter and essentially uniform in the posterior region. Appendage of setae with subapical tooth larger and stouter, more obtuse, than in *alternata*, making a wider angle with the apical tooth, and always conspicuous; the serrations proximad of the tooth fine and rather long. The body is proportionately rather wide and is depressed or flattened, narrowing in the posterior region but retaining there the depressed form. Number of segments in the type, near one hundred and forty-five. General color yellowish; each somite of anterior region crossed transversely by two fine complete lines of reddish brown color.

Width in anterior region, exclusive of parapodia, about 1.25 mm.; length near 20 mm.

Type—M. C. Z. 2, 147.

Taken at low tide.

The type is a female turgid with eggs. It is remarkable in presenting at the same time a well-developed collateral bud from the ventral surface near the beginning of the posterior third.

Pionosyllis pigmentata sp. nov.

Somewhat resembling *P. elongata* (Johnson), which also occurs in this region, but differing in having the dorsum pigmented throughout, being black or slaty with pale lines between the segments and dividing each of the latter transversely excepting across the middorsal region. The pigmentation may sometimes be very dilute. In technical details readily distinguished from that species, e. g., in the different form of the appendage of the setae, this being obviously more elongate and erect and proportionately more slender. Two or more dorsal setae differ in having shorter, more strongly curved appendages which are wholly smooth on the concave edge instead of being pubinate to beyond middle as in the others. Prostomium rather short and

broad. Palpi thick the ectal lobe small as compared with the principal or mesal one; united only at base. Eyes small, transversely elongate and often curved, the two on each side close together and sometimes almost fused, with the posterior one well mesad of but only a little caudad of the anterior one. Median tentacle situated midway between the two eye groups in a longitudinal furrow dividing prostomium; composed of eighteen to twenty-three short articles. Each paired tentacle at corner of prostomium in front of eye-group of corresponding side; similar in form and size to the median tentacle. Lower tentacular cirrus about equalling a tentacle in length, the dorsal longer, both of similar form. First segment extending forward in a rounded or subtrinangular lobe or flap at middle above. The notocirri attached above bases of parapodia as usual; long, composed of numerous short segments; much longer than the tentacles, each average one when laid back along body ordinarily passing over three or three and a half segments. Neurocirri short, stout, fusiform. Body slender, narrowed moderately at the ends, elsewhere of nearly uniform width. Type composed of seventy-three segments.

Length, near 20 mm.

Type—M. C. Z. 2, 148.

Littoral zone.

Pionosyllis lucida sp. nov.

Readily differentiated from *P. elongata*, which it resembles in its pale, translucent appearance, in having the distal appendage of setae more typical, being of a decidedly more elongate and erect form which also differs from that of *pigmentata*. From the latter differing conspicuously in appearance in lacking all dark pigment. Notocirri tapering distad, with apical region slender and pointed; long, exceeding the width of the body and consisting of up to forty-five articles. Differing from *pigmentata* in the form of the neurocirri which are more uniform in diameter, subcylindric rather than fusiform; normally extending more or less beyond the tip of the parapodium. Prostomium short. Eyes reddish; those of first pair larger than the second; second eye on each side almost directly mesad of the first but only a little caudad of it. The median tentacle farther forward than in *pigmentata*, well in front of the eyes, its anterior edge being nearly in line with the caudal margins of the paired tentacles; composed of twenty-eight or more short articles. Paired tentacles much shorter and also more slender; composed of about twenty articles. Palpi fused at base as usual; narrower distally than in *pigmentata*. The types are incomplete caudally; but the body is evidently slender. One specimen 8 mm. long consists of forty-three segments; and a second, somewhat thicker one, of nearly the same length consists of thirty-seven. The width is near 1 mm.

Type—M. C. Z. 2, 180.

Hesperalia gen. nov.

Palpi thick, fused at base only to middle of length. Pharynx straight. Proboscis unarmed (?). Tentacles three, attenuated, more or less obviously jointed. Eyes two pairs; large. Tentacular cirri two pairs. Parapodia uniramous with setae all compound, or in the epitokous phase with long simple natatory setae in notopodia of middle region of body. Appendage of compound setate short, bidentate. Neurocirri present, thick, rounded. Notocirri on side of body above parapodia; filiform; more or

less segmented. A large quadrate membrane or flap projecting from anterior edge of peristomium forward over caudal region of prostomium.

Genotype.—*H. californiensis* sp. nov.

Hesperalia californiensis sp. nov.

Body rather stout for a syllid, more as in Hesionidae; broadest and deepest anteriorly, continuously narrowing caudal to the pointed posterior end. The color of the dorsum is blackish, with pale transverse lines in the intersegmental furrows and bisecting each somite which under the lens thus appears double. Parapodia and cirri typically pale fulvous and the venter either similar or approaching the dorsum in color. Prostomium very short, sunk in the first body ring and almost completely overlapped by the quadrate flap from the latter, this flap extending over the bases of the tentacles in the type. Palpi stout, presenting two main lobes fused to their apices or nearly so, and on each of these an ectodistal lobe projecting ventrocephalad, these distal lobes wholly free from each other. Tentacles appearing nearly smooth; tapered; the median exceeding the lateral in length. Eyes large; in type orange colored; the two on each side contiguous or nearly so; posterior ones nearer together, each beneath edge of the quadrate peristomial flap, while the anterior ones are in line with base of median tentacle. Tentacular cirri of same form as tentacles but longer. Neurocirri thick, short, distally rounded. Natocirri long, filiform, tapering distad, weakly ringed; showing a tendency to alternate in height on the sides of the body, the first being notably farther distad than the second, the third than the second and fourth, etc. Setae numerous; the appendage short, falcate, with tip simple, but a slender tooth near middle of curved edge. Segments short, crowded, near one hundred in number.

Length of type, 21 mm.; greatest width, 2.2 mm.

Type—M. C. Z. 2, 149.

Taken in August, 1914.

Hesperalia nans sp. nov.

The type of this species is in the epitkous phase. The middle region of the body bears notopodal fasciae of long, fine, simple, natatory setae in addition to the compound neuropodials. The appendage of the compound setae differs from that of *californiensis* in having the accessory tooth farther distad, well beyond the middle of the concave edge, whereas in the other species it is normally rather proximad of the middle. In the present species the prostomium is proportionately larger, less covered by the peristomial flap which does not extend over the base of the median tentacle. The palpi are not fused so far distad, being unitd only at base; they present below on each a large distal lobe similar to that in the other species. Eyes with prominent lenses; large; those on each side sub-contiguous. Median tentacle in line with the centers of the anterior eyes; short and pointed, shorter than the width of the prostomium. Paired tentacles a little shorter than the median; each attached in front of the median at a point midway between the latter and the anterior eye. Tentacular cirri much longer than the tentacles, attenuated distad, pointed. The notocirri are all similarly attenuated and run out to a rather fine point. Neurocirri very thick, conical, each with a black dot near middle. Contrasting with the preceding species in color in having the dorsum in general light, fulvous, in part slightly dusky, with a series of dark, blackish, transverse lines across dorsum, there being four somites between each two dark lines. The body is narrowed toward both ends; venter flat and dorsum

strongly arched; hesioniform. Because of the broken condition of the type the number of segments is uncertain, but is near seventy-five.

Greatest width, exclusive of parapodia, 1.5 mm.

Type—M. C. Z. 2, 150.

Dredged August 27, 1917.

Campesyllis gen. nov.

Like *Streptosyllis* in having the pharynx strongly sinuous and unarmed and in lacking nuchal flaps such as characterize *Amblyosyllis*. It differs from the former genus in having only composite setae and in having these of the ordinary structure, the appendage of a simple, fringed form not covered by a membrane. Eyes two pairs instead of three. Tentacular cirri two pairs. These, as also the tentacles and notocirri, short, articulated. Neurocirri attached proximally.

Genotype.—*C. minor* sp. nov.

Campesyllis minor sp. nov.

The type of this small form is only 2.5 mm. long. The pharynx is strongly sinuous. The palpi are contiguous throughout and are fused for most of length though a median furrow or sulcus above and one below run to base; projecting forward; together they narrow distad, with outline triangular; shorter than prostomium. Eyes two pairs, well separated, subequal, forming a nearly straight transverse row a little in front of the peristomium. Median tentacle attached far back between posterior eyes; short, a little exceeding prostomium and palpi together. Lateral tentacles also short, each attached at cephaloectal corner with the prostomium bulging forward between them. Tentacular cirri and notocirri also short, the latter in anterior region about equalling half the width of the body proper and not extending much beyond the tips of the setae; joints short, near fifteen or less in number. Neurocirri subcylindric, slender, reaching ends of parapodia. Setae transparent; end of shaft but little enlarged, its articular edge very oblique; appendage long and slender, the tip curved, the edge strongly fringed. Body ventrally flat, convex dorsally, strongly narrowed caudad.

Taken in a sabellid colony.

Type—M. C. Z. 2, 151.

NEREIDÆ

Nereis latyscens sp. nov.

Allied to *N. vexillosa* (Grube) but a much smaller species readily distinguishable superficially through the presence of purplish markings on the prostomium and anterior segments, by the form of the appendages, and particularly by the presence on region V of the proboscis of a single large conical tooth such as is present in various capitokes. The prostomium is marked above by a large purplish area germinate by a narrow median longitudinal yellow line. Eyes black. On the anterior segments, above on each side a transverse purplish stripe along anterior and one along posterior border and across the dorsal region, a shorter but broader stripe a little in front of the middle of segment. The body otherwise yellowish. Eyes exceptionally large, and those of each side very close together. Tentacles close together, slenderly cylindrical, moderately narrowing distad, shorter than prostomium and not extending beyond end of proximal joint of palpi. Paragnatha in general as in *vexillosa*; area I with but a single tooth; II, III and IV with numerous teeth in a patch on each; V with a single exceptionally large tooth; VI with four teeth in a quadrangle; VII and VIII with teeth

in a band across ventral and lateral surface in which the proximal ventral teeth are smaller than the distal as in *vexillosa*. Peristomium shorter than prostomium and than the next two somites combined; divided by a transverse furrow. Tentacular cirri short; the ventral ones subequal, less than half the length of the dorsals, which are also nearly equal to each other; more or less flattened; cirrophores short. A typical parapodium presents three stout conical lobes additional to the setigerous ones; of these the dorsal one in the anterior region is stoutest, but becomes more slender in the posterior region. Both notocirri and neurocirri proportionately very slender. Anal cirri about as long as the dorsal tentacular cirri, flattened.

Number of segments, sixty-two.

Length of types, 20 to 23 mm.

Type—M. C. Z. 2, 152.

Taken among hydroids.

Nereis mediator sp. nov.

This species also resembles *N. vexillosa*, though apparently a normally much smaller form. It is, so far as evidence at present accessible to me indicates, distinguishable from that species in having a narrow band across the anterior border of the dental band of VII composed of much finer denticles instead of having the anterior teeth large and the posterior ones reduced. The paragnatha are fewer than in *vexillosa*, those of II, e. g., being in fewer (usually three), less oblique and more separated series and those of VI in all the typical specimens being three in a triangle or four instead of from six to nine or more in a crowded patch. No colored markings. The tentacles proportionately thicker and obviously closer together. Tentacular cirri shorter. Notocirral laminae of the middle and posterior regions much less elongate and flattened with their ventral conical lobe much more pronounced throughout, more as in the smaller specimens of *vexillosa*. Anal cirri short. Number of segments up to seventy.

Length, to 60 mm.

Type—M. C. T. 2, 153.

This is doubtless the same form as recorded by Dr. Moore from San Diego as *N. vexillosa* in Proc. Acad. Sci. Phil., 1909, p. 244. It is undoubtedly close to that species; but as all the specimens which I have seen, and apparently also those studied by Moore, differ constantly in the features above mentioned from specimens of *vexillosa* from more northern localities on the Pacific coast, etc., the form is maintained as distinct. A single heteronereis female is among the specimens from Laguna Beach.

LEODICIDÆ

Leodice monilifer sp. nov.

Yellow in color, Body strongly narrowed caudad. Prostomium short and broad. The palpal lobes large and rounded, bulging conspicuously forward and ventrad; separated by a deep furrow. Tentacles in a slightly curved transverse line, the outer paired tentacle on each side lying a little farther forward than the inner. Ceratophores very short and not broader than bases of styles, exceeded by the first segment of style which about equals the next two in length. The styles in general strongly moniliform, the articles short and well rounded. The styles in types short but not in any case certainly complete; the number of articles present from nine to twelve. The peristomium much longer than the prostomium than which it is also clearly wider and

higher; entire second somite very short, not more than one-fourth as long as I. Nuchal cirri short and conical, much shorter than the peristomium, transversely wrinkled or sometimes distinctly annulated. Notocirri slenderly conical, becoming more slender in posterior region as usual; with some weak encircling wrinkles but not distinctly divided into articles. Branchiae begin as single filaments on IX or sometimes on VIII. Branchiae of X each consisting of two filaments. The number in several of the succeeding branchiae increases to three, then again falling to two, and, finally, the last eight pairs or so are again simple filaments. The last branchiae in the type occur on XXXII. Anal cirri short, slenderly conical. Moxillae strongly chitinized; brown, with edges in part black. In maxillae II the right plate has six large teeth, the outer left plate four and the odd or inner left plate seven or eight. III with nine teeth or crenulations. Number of segments in type one hundred and nine.

Length, 43 mm.; greatest width, exclusive of parapodia, 2.6 mm. An incomplete larger specimen has a width of 3.2 mm.

Type—M. C. Z. 2, 154.

Taken among holdfasts of kelp. (C. F. Baker, June 30, 1911.)

Arabellula lagunae sp. nov.

As compared with *A. attenuata* Treadwell, this is a smaller species differing in appearance in being brown of a decided greenish tinge, excepting on the prostomium and at the caudal end. The prostomium is less narrowed cephalad, being more broadly rounded across anterior end. Median eyes not exceeding the lateral in size. Maxillae V represented by simple small hooks. IV with five teeth of which the most ectal (upper) is long and slender, the two next much shorter and finer and the two innermost closer together. III with fine teeth similarly arranged and formed. Maxillae II nearly symmetrical; the left one with seven teeth of which the most anterior one is much largest, the right with an additional small tooth in front of (ectad of) the large one; neither of the plates extending caudad of the anterior end of the dental series of I. I with seven or eight well developed teeth; the carriers very long and slender, black throughout. In the paraphodia the posterior lobe is well developed, stout and conical, distally somewhat blunt or rounded, extended ectad or caudo-ectad and is always shorter than the setae. Setae all simple, limbate, in a single series of mostly six in the middle region of the body. Setae with the usual double or sigmoidal curve over the limbate part, the first bend or geniculation unusually strong, angular; tip becoming fine and hair-like. Body tapering caudad, pointed at the posterior end, ending in two blunt lobes. Number of segments in the type one hundred and ninety-one.

Length, 46 mm.; width, exclusive of parapodia, 2 mm.

Type—M. C. Z. 2, 155.

Taken at the shore "under rocks."

Irabellula mimetica sp. nov.

Resembling the preceding species though smaller and more slender. Superficially differing obviously in the form of the prostomium which is much more narrowed distad and is neither depressed nor furrowed either dorsally or ventrally. Eyes smaller, obscure. Maxillae resembling those of the other species in general, but differing strongly in the second pair in which the right plate, instead of being symmetrical with the left one, is decidedly long and extends far proximad along the dental line of I and bears about fifteen teeth as against only six on the left one and eight on the cor-

responding plate in *lagunae*. Maxillae I on right side with nine teeth, on left apparently with seven. Maxillae III with teeth in arrangement as in *lagunae* but only four in number and different in all being blunt and shorter. IV as in the other species but teeth four instead of five. The number of segments in the type is near one hundred and sixty-five.

Length, 40 mm.; width, 1.1 mm.

Type—M. C. Z. 2, 156.

Taken among holdfasts of kelp. (C. F. Baker, June 30, 1911.) Also a small specimen taken August 2, 1917, by Prof. Hilton.

Biborin gen. nov.

Setae all simple, limbate, well developed. First two segments achaetous. Eyes none. Maxillae absent, but the mandibles normally developed, the wall of the alimentary canal opposite the latter simply thickened. Notocirri rudimentary.

Biborin ecbola sp. nov.

Biborin ecbola sp. nov.

The type as preserved is greyish brown of a dull bluish green cast. A note with the specimen also states that it is greenish in life. The body is strongly attenuated and pointed caudad, more moderately cephalad. The prostomium larger than wide and somewhat longer than the first two segments; subconically narrowed distad, apically rounded, flattened dorsoventrally. The two achaebous segments subequal in length or the second slightly longer, not produced forward below. Mandibles short and broad, not toothed, the edges meeting at an acute angle in front; the caudal stems shorter behind point of separation than the blades in front of this point, rather slender, blunt behind. Posterior lobes of parapodia subcylindrical, a little conically narrowed distad but with apex well rounded, extending ectad or caudoectad; in middle region of body reaching to or a little beyond middle of longer setae, the setae relatively shorter in anterior region. Setae all simple and limbate with the usual double curve, the first curve or angulation obviously less marked than in *A. lagunae*, which form this species superficially resembles. Number of segments in type, two hundred and seventy-seven.

Length, 92 mm.; width without parapodia, 2.2 mm.

Type—M. C. Z. 2, 157.

Taken among *Phyllospadix*, September 17, 1917.

GLYCERIDÆ

Glycera exigua sp. nov.

A small species easily recognizable among the known forms of the California coast by the character of the parapodia. Each of these present three lips, two anterior and one posterior; all three lobes triangular, pointed distad, with the posterior one fully equaling the other two in length. The neurocirrus is also triangular in outline. The natocirrus is reduced to a small rounded or nodular form slightly above base of parapodium. Branchiae simple cylindrical filaments, each attached toward distal end of parapodium above as in *G. alba* and *G. longipinnis*; the first occurring on or near somite XXX, short, in actual length not greater than parapodium exclusive of terminal lips and falling much short of reaching ends of setae; absent from last twelve segments or so and those just in front of this caudal region much reduced. Prostomium of usual general form; consisting of fourteen or fifteen rings. Proboscis

long; weakly longitudinally ridged and densely finely papillose. Body strongly narrowed from the anterior region caudad, the caudal end slenderly pointed. Segments biannulate. Number of segments in the type near one hundred and thirty.

Length, 26 mm.; width, 1.5 mm.

Type—M. C. Z. 2, 158.

Balboa, December 26, 1917.

Glycera basibranchia sp. nov.

Resembles *exigua* in having the branchiae in the form of a series of single, simple filaments but readily distinguished in having each branchia attached at base of parapodium on the dorsocaudal surface just ectad of the notocirrus instead of at the distal end above. The branchiae begin on the twenty-ninth setigerous somite and continue to about the one hundred and twenty-ninth, decreasing in size at the two ends of the series. In the middle region they are cylindrical, distally rounded, and transparent, and at most do not surpass the distal end of the parapodium, most of these being obviously shorter than this in the preserved specimen. Also decidedly different from *exigua* in having four lobes at the distal end of each parapodium, two postsetal and two presetal. These are narrowly triangular, distally pointed, with the presetal lobes thicker and more conical and decidedly longer than the postsetal. The short, distally rounded notocirri are attached at the base of the parapodia above in the angle between the latter and the body wall. Neurocirri distally subcylindrical, resembling the distal parapodial lobes. The prostomium distinctly ringed to near middle, the basal half showing five rings while the distal half in the type is only vaguely annulate, though with indications of apparently seven nearly fused rings, making the total number twelve. Proboscis long, densely papillose. Type incomplete caudally; one hundred and forty-five segments retained.

Length (not quite complete), 36 mm.; greatest width, 1.3 mm.

Type—M. C. Z. 2, 159.

A note gives the color in life as light, the red blood showing through as usual in the family.

Glycera verdescens sp. nov.

A very small form differing from the two preceding in wholly lacking branchiae. The parapodia are strikingly different in that the postsetal lobe is either wholly absent, as in anterior region, or is represented by a single, small, pointed process, while there are two presetal lobes which are long and subcylindrical or finger-like and of which the ventral one is ordinarily the larger. The notocirrus is small and occupies the usual place in the angle between the dorsal surface of the parapodium and the body-wall. Neurocirrus slenderly conical, darkened distad as are also the presetal lobes. The slenderly conical prostomium showing twelve annuli. Type at present showing a distinctly greenish tinge. Type incomplete caudally, sixty-nine segments retained, the length being 13 mm., width, 1.1 mm.

Type—M. C. Z. 2, 160.

ARICIDI

Nanoreta hespera sp. nov.

This is apparently a smaller species than *longa* or *robusta* and is composed of fewer segments. It differs from those species in having the anterior division of the body composed of only nineteen segments and in having the first branchiae appear on

the thirteenth or fourteenth segment. The prostomium is broadly subtrapeziform, narrowing forward and with the anterior margin varying from slightly convex to mesally indented as is the case in the type; dorsal surface nearly flat, simply marked with two furrows, or sometimes with the median caudal region between furrows elevated. Peristomium with anterior margin above more or less concave, its median length about equal to that of the second segment, which is also ordinarily bowed caudad. In the neuropodia of the anterior region the postsetal processes are broad, distally rounded, thick lips which are prominent; in the posterior region these become narrowly conical, elongate, distally pointed processes. The postsetal processes of the notopodia in the anterior region are thick, short cones which increase in length in going caudad, in the posterior region being very elongate. The branchiæ begin on the thirteenth or fourteenth segment as short processes but become abruptly longer, basally thick and distally pointed processes much thicker than the postsetal processes of the notopodia and exceeding these in length; they are widely separated and, while curving in somewhat mesad, do not come in contact, leaving much of the mid-dorsal region naked. They continue to the end of the body. The neuropodial setæ of the anterior region are arranged in three subvertical series and form a patch twice as high (dorsoventrally) as long (cephalocaudally). The stout setæ of the posterior row are mostly four in number, less commonly three or five. These coarse setæ are not at all clavate as in elongata and are not roughened or cross-ridged above the curve as in robusta; the terminal region above the curve longer than in the later species. The setæ of the other series are more curved than in robusta and are abruptly contracted farther from the body. the contraction stronger but the one edge similarly roughened or denticulated with cross lines. At the ventral end of the series a small patch of ordinary, camerated, capillary setæ resembling the notopodials. The body is broad anteriorly and narrows to the posterior end. Dorsal surface flat and the ventral convex as usual. Number of segments in the type one hundred and thirty-six. Color in general pale brown; at black spot at base of each branchia at least those of posterior region, in front and behind and the proximal part of branchia often darkened.

Length, 27 mm.; greatest width, 2.4 mm.

Type—M. C. Z. 2, 161.

Scoloplos acmeceps sp. nov.

Resembling *S. armiger* (O. F. Müller) in general structure. A less deeply pigmented species easily distinguished from this northern form in wholly lacking the ventral papillæ (neurocirri) present in the latter below the parapodia of about the eighteenth to thirtieth segments. The prostomium is similarly elongate and pointed but is more slender; it is borne at the end of the peristomium which has the form of a truncate cone. The branchiæ begin anteriorly in the same way as very slight elevations and increase quickly to long ligulate forms; but the first one appears on the sixteenth or seventeenth setigerous segment instead of on the twelfth or thirteenth as usual in armiger. The fully developed branchiæ are obviously narrower than typical for the latter species. The lobes of the parapodia are in general similar though they do not become obvious so far forward. In the second division of the body the ventral lobe is similarly elongate and bifid at the tip with the inner or more dorsal lobe the longer; but the lobes are characteristically more divergent, thinner and more slender. The first bifid neuropodial lobes appear on the twenty-first setigerous segment. The

dorsal lobe similar in form to that in *armiger*. Caudal end of all the types missing.

Greatest width, 2 mm.

Type—M. C. Z. 2, 162.

Balboa (Sept. 10, 1917).

FLABELLIGERIDÆ

Flabelligera haerens sp. nov.

This species resembles *F. commensalis* Moore in the approximation of the neuropodia though these are apparently not so close as in that species and are at no place actually contiguous though nearly so in the extreme caudal region. In front of this they remain a uniform distance apart, which is less than the length of a somite, forward to about the tenth somite from where the rows diverge gradually forward. The notopodia more widely separated, the rows diverging cephalad from near the tenth somite, always much closer to each other than to the neuropodia. Ventral surface flattened or weakly concave, the dorsal surface also flattened but slightly convex, while the sides are convex; the body in part is slightly compressed from side to side, in cross-section subquadrate to subcircular; widest in middle region and narrowing both ways, more strongly so caudad, subfusiform. Collar lobe deeply and widely incised dorsally and ventrally; the lobe on each side bearing a series of numerous long cross-striated setæ which are reddish brown in color and are stouter than the ordinary notopodials. The notopodials are simple, finely tapered, colorless setæ. There is a single seta in each neuropodium, this being in the form of a very stout hook; the color is dark throughout; the transverse terminal portion of the hook is longer and more slender and acute than in *commensalis* and the pseudo-joint is farther proximad of the curved region; the shaft is bent caudad at the level of the joint, the hook proper curving mesad. The entire surface is densely papillose. The setæ of the collar are cloaked by a dense growth of long filiform papillæ with large clavate tips, these papillæ approximating the setæ in length. The papillæ also cluster densely about the notopodia, these papillæ having similar clavate tips. The papillæ of the general surface of dorsum, venter and sides are much shorter. Color nearly uniform greyish brown. Number of segments in type, forty-nine.

Length, 13 mm.

Type—M. C. Z. 2, 163.

Taken in holdfasts of kelp, August 12, 1917.

CAPITELLIDÆ

Natomastus angulatus sp. nov.

In comparison with *N. tenuis* Moore, known from San Diego, this species differs in the form of the thorax, which is strongly angulate instead of terete the sides and venter being flat and the dorsum usually but little convex, so that the cross-section is nearly quadrate; also in having the segments and their subdivisions sharply separated with the posterior subsegment in each case much shorter than the anterior instead of equal to it. In the type the posterior thoracic somites are twice or more as long as wide, but in some paratypes the relative length is much less. Thorax narrowed caudad. The abdomen in its anterior part obviously thicker than the thorax in its widest part. The prostomium characteristic, showing two distinct regions, a broad posterior one with convex, anteriorly converging sides and a narrower, subconical, palpoidal ter-

minal part sharply set off from the basal. Segments of abdomen irregularly multianulate, sulci deep and surface usually appearing strongly rugose and uneven.

Length near 160 mm.; greatest width of abdomen, 1.4 mm.

Type—M. C. Z. 2, 164.

Taken in sand and in growths of eel grass. The color is noted as reddish in life, as usual in the family.

SPIONOIDEA

Morants gen. nov.

Body with an anterior region of fifteen setigerous somites separated from a larger posterior region by a specialized somite, the sixteenth. Prostomium with a lateral process or horn on each side in front, notched in front at middle. Eyes none in genotype. Dorsal cirri present in addition to branchiæ on the first four setigerous somites. Notopodia with simple capillary setæ throughout. Anterior neuropodia with capillary setæ, but others also with crochets. Anal. cirri two.

Genotype—*M. duplex* sp. nov.

Morants duplex sp. nov.

Palpal processes lost from type. Proboscis as protruded short, distally expanded over proximal region. Parapodia dorsolateral in position, the anterior ones very thick. Principal postsetal lobe rising above into a branchial process which is short anteriorly but in posterior region is much longer, slender and subulate. Mesad of the branchial process of each parapodium of the first four pairs is a cirrus or cirriform process. The inferior setæ of the most anterior parapodia much shorter than the dorsals, strongly curved. In the first notopodial fascia a much stouter, aciculiform, setæ which is uncate. Crochets with strongly narrowed neck; with two curved teeth at distal end above the beak which is decurved; in posterior region few in number, commonly four in a series. Anal cirri slender, filiform, much longer than the preceding branchiæ; one in the type has a short spur near its base. Total number of segments about one hundred and sixteen.

Length, 21.5 mm.

Type—M. C. Z. 2, 165.

Balboa.

The tubes adhere closely to the body. Their walls of fine sand.

AMPHARETIDÆ

Schistocomus gen. nov.

Like *Phyllocomus* in lacking tentacles and postbranchial spines, in bearing fifteen pairs of fasciæ of capillary setæ and four pairs of branchiæ. It differs from that genus in having the branchiæ of two types, one pair being of the ordinary, smooth, simple, subulate form and the other three with the edges divided, two pinnately, bearing two close series of lamellar branches, and one with an essentially single series of branches in the genotype.

Genotype—*S. hiltoni* sp. nov.

Schistocomus hiltoni sp. nov.

The body has the ordinary general form, being widest near the fifth setigerous segment from where it narrows continuously to the slender, pointed cauda. Dorsum convex, venter less so, the latter with a double median longitudinal furrow in the

posterior region. Prostomium projecting forward as a simple hood with rounded anterior corners and the median region of anterior edge nearly straight; dorsal surface in type longitudinally wrinkled. Ventrally the peristomium projects forward between the sides of the prostomium in a conspicuous lobe or lower lip which narrows somewhat distad and has the distal margin convex; surface longitudinally wrinkled. Second somite achaetons. The third bearing the first fasciæ of simple setæ, the sixth the first uncini. Of the pinnate branchia one pair occur on the third setigerous somite and one on the second while the branchiæ with single series of branches in which the branches are less lamellate, are on the second (first presetal) somite, the simple branchiæ arising on the first setigerous somite. The first branchiæ are attached near the middle of the dorsum, the others laterad close above the parapodia. The first and especially the second or simple branchiæ extending forward beyond the anterior edge of the prostomium. Color light fulvous or in part greyish. Number of segments near fifty-five.

Length, 22 mm.; greatest width, 3 mm.

Type—M. C. Z. 2, 166.

Taken at Laguna Beach Sept. 15, 1917.

The tube in which the type was found is 35 mm. long. The wall is thickened by the adhesion of fine particles of sand, fragments of shell, etc.

TEREBELLIDÆ

Leaena videns sp. nov.

The prostomium extends as a convex hood or inverted scoop above the mouth; along its posterior border is a series of long, crowded, tentacles. The prostomial fold behind the tentacles is crossed by a transverse band of distinct eyes, the band narrow above and widening on each side. Mouth a crescentic slit with corners curved caudad; bordered behind by a thick lip the anterior median edge of which is truncate. No dorsal cirriform process on III or any other segment, all being wholly smooth. A characteristic of the species is the large number of setigerous segments, at least thirty-one being present (IV-XXXIII) in the type, and possibly more. The setæ differs from those of *nuda* in their longer fine tips and more geniculate appearance at base of this region. The uncini are characterized by an exceptionally long beak which, beyond its strongly curved base is straight; the sinus narrow, the process arising near its middle, low obtuse; vertex not comparatively high, crossed by mostly four series of denticles; body of uncinus rather narrow, the shoulder on convex side much farther toward the end than, e.g., in *nuda* and well below level of bottom of sinus. The type is incomplete, only near thirty-eight segments being present. The color is noted as pinkish in life. At present it is fulvous in the type.

Length of incomplete specimen not in excess of 12 mm.; greatest width, .8 mm.

Type—M. C. Z. 2, 167.

Pista tritella sp. nov.

This form seems to be close to *P. alata* Moore. The type, which is much smaller than that of *alata*, differs in various details from the description of the latter. The principal lateral wings are confined to the third segment and are united across the dorsum of third somite instead of involving the anterior border of IV and crossing the latter above; connecting dorsal fold low and lacking any forwardly directed process; the wing rises as a high, rounded lobe on each side just below level of setigerous

tubercles, rising high above the middorsal surface. In addition to the prominent wings on III there is on IV on each side a much lower ridge or wing paralleling that on III, this not more prominent above. Unlike those of *alata*, somites II and III are not confounded laterally but are distinct throughout. Prostomium short. Tentacles mostly lost in type; rather slender, not long, apparently in but a single transverse series. Peristomium deeply excavated at middle below, the bottom of the excavation rounded and the peristomium produced on each side of this into the usual large lobes. The branchiæ, as in the genotype and other species, strongly asymmetrically developed. The right anterior branchia is much the largest, the trunk very long, with the left anterior much smaller. Of the posterior pair, the right, unlike that of *alata*, is also much larger than the left one. In the type the sternal plates are not sharply differentiated. The manubriate uncini of V have the general form of those in *alata*, but the bulge below the beak is much larger and more rounded with the subrostral tooth more obtuse and nearer the middle of the oblique edge; beak less divergent from manubrium; vertex with three transverse series of denticles. The color in the abdominal region light fulvous, in the thoracic darker with a narrow brownish stripe along caudal border of each segment laterally and ventrally. Type not quite complete caudally, retaining eighty somites.

Length, 36 mm.; greatest width, 2.8 mm.

Type—M. C. Z. 2, 168.

The wall of the tube is composed of sand and shell fragments.

Naneva gen. nov.

Prostomium short; with numerous tentacular filaments. Uncini avicular and of same form throughout. Setæ beginning on third somite; tips simple. Uncini beginning on the fourth somite. No lateral foliaceous lobes on the anterior segments. Branchiæ two pairs; branched; attached on somites II and III.

Genotype—*N. hespera* sp. nov.

Differs from *Thelepus* and *Athelepus* in having the branchiæ branched instead of simple and in having the uncini begin on IV.

Naneva hespera sp. nov.

The prostomium forms a prominent upper lip of which the anterior border is turned upward all along, leaving a deep concavity between it and the upcurving posterior fold along which the tentacles are attached. Because of their curled and tangled condition the precise number of tentacles was not ascertained, but is about twelve on each side; they are long, some when fully extended being 15 mm. in length. No eyes were detected in the type. Peristomium forming a lower lip of but moderate length with straight anterior edge; scarcely twice as long as the second somite below. First branchia on each side attached to second somite just in front and mesad of the first setigerous tubercle. The second branchia attached just caudad of the first on the caudal region of somite III. Both branchiæ very similar, each presenting three principal branches of which the most mesal is largest; ultimate branches numerous, rather short. Capillary setæ beginning on III and continuing to XXVII. The anterior setigerous processes are in the form of vertical plates with straight truncate, distal edge; but in going caudad these become reduced finally to slight tubercles, with the first about equal to half the intervening space and by the seventh equal to this space, while in the abdominal region the opposite series are separated merely by the median furrow. Anterior ventral plates strongly longitudinally furrowed. Capillary setæ

narrowly bilimbate, drawn out into a very fine simple tip. Uncini, at least for the most part, in two series both in thoracic and in abdominal region; apparently with mostly three transverse rows of denticles at vertex; beak long, the sinus with parallel sides, opposite side of body evenly curved, not distinctly shouldered. Total number of segments in the type, which is complete, about one hundred and thirty, of which II to XXVII are setigerous. Body rapidly narrowed to the eighteenth segment, but only very gradually thereafter.

Length, near 45 mm.; greatest width, 1.8 mm.

Type—M. C. Z. 2, 169.

Balboa.

SABELLID.E

Myxicola monacis sp. nov.

In size and general appearance resembling *M. pacifica* Johnson, with the type of which it has been compared. From that form the present one may readily be distinguished in having the ventral median process from the first segment drawn out into a slender entire tip instead of being broad and presenting distally two angles or lobes; the process is furrowed longitudinally and the edges are somewhat turned down. Branchiæ twenty-two pairs. Readily distinguished by the form of the abdominal uncini. These have the general form of those of *pacifica* but as a whole are longer with the body proportionately more slender and its abvertigial end more rounded; the beak is longer and less divergent, distally curving a little back toward the body; the sides of the sinus parallel. The body in the type is somewhat fusiform, being narrowed both ways from the middle but more strongly so caudad. In a paratype the body is scarcely narrowed cephalad. Body somewhat depressed dorsoventrally, less terete than in *pacifica*. Total number of segments near seventy.

Length of type, exclusive of branchiæ, 40 mm.; greatest width, 6.2 mm.

Type—M. C. Z. 2, 170.

Taken from holdfasts of seaweeds.

Potamilla clara sp. nov.

The body in general light brown; but ventrally there is a median longitudinal fulvous stripe over the ventral plates. The branchiæ are crossed by a series of dark bands or annuli which fade out proximally, about three distad of the middle of length being deep and distinct. There are nineteen pairs of branchial radioles; barbs numerous, densely arranged to near tip, the naked distal region of axis very short, pale excepting where partially or completely involved by the transverse dark bands. Ventral lobes of collar moderate, rounded, edges a little rolled down; dorsal ends separated; no lateral incisions, being but two-lobed; not produced forward below, lobes rounded and separated. Thoracic segments eight. Ventral plates all rectangular, those of the abdomen divided by the midventral sulcus. Total number of segments, sixty.

Length without branchiæ 21 mm.; length with branchiæ, 28 mm.; greatest width, 3 mm.

Type—M. C. Z. 2, 171.

Taken on beach at low tide.

Potamilla omissa sp. nov.

The general color is dusky or pale brownish with the anterior ventral plates lighter and the branchiæ rather weakly transversely banded with dark. Radioles of

branchiæ in a simple series; seventeen pairs. Collar well developed, produced forward below in two pointed lobes overlapping at the middle. Eight setigerous thoracic somites. Most dorsal thoracic setæ in each fascicle long and finely pointed with wings narrow; the ventral setæ much more numerous, shorter, spatulate, with fine tip. The uncini have the posterior process very short, rounded at the end, much shorter and more slender than the neck, which is rather strongly curved; vertex high and narrowly rounded; beak not strongly depressed. Type incomplete, only seven of the abdominal segments being present.

Length of first sixteen segments, 15 mm.; including branchiæ, 21 mm.; width, 2.5 mm.

Type—M. C. Z. 2, 172.

Potamilla colorata sp. nov.

The type is notably marked with black pigment; the collar membrane crossed with a close series of longitudinal dark stripes, one in line with each radiole and narrowing caudad; the branchiæ crossed transversely with dark bands. Thoracic somites, more notably the anterior ones, with a dusky to black band in front of each uncigerous torus and a dark spot on the dorsum mesad of the setigerous papilla. The collar with a dark area ventrad and also dorsad of the fascicle. Ground color greyish of light brown cast, lacking the yellow dominating in *omissa*. Sixteen (or seventeen) pairs of radioles in the branchiæ. Ventral lobes of collar pointed, widely overlapping in the median line, dorsal ends free, projecting toward each other in dorsal groove. Setigerous thoracic somites eight in number. Inferior setæ numerous, spatulate, usually in two series. Total number of segments present about fifty-one, a few of the most caudal being lost.

Length, 25 mm.; with branchiæ, 30 mm.

Type—M. C. Z. 2, 173.

Pseudopotamilla paurops sp. nov.

A rather slender species with branchiæ of moderate length. Excepting the eyes with no pigmented markings. Radioles fifteen pairs. Eyes few, not present on all radioles; where present usually but a single one on each radiole, in one case two; the eyes deep purple, variable in size from moderate to small; situated at varying distance between base and middle of length of radioles. Free dorsal edge of branchial membrane with two short obtuse lobes overlapping in the middle line. The dorsal notch in the collar lobe on each side is mesad of the line of setigerous tubercles, wide open, rectangular or slightly obtuse; lobe mesad of notch small, anteriorly rounded, the mesal edge extending into the dorsal furrow; median ventral lobes separated by a narrow incision, short, the ectal edge passing out in an even concave curve to the anterior lateral margin. A characteristic feature of the species is the presence of ten setigerous thoracic somites. Dorsal setæ of the usual two types of which the upper are much fewer spatulate setæ in two series with distal expansion broad and wings asymmetrical, tip short. Total number of segments, seventy-eight.

Length without branchiæ, 31 mm.; with branchiæ, 36 mm.

... Type—M. C. Z. 2, 174.

Tube tough, corneus.

Pseudopotamilla parva sp. nov.

The type of this species is a small individual which, as preserved, appears of a uniform dusky color throughout. Branchial radioles fourteen or fifteen pairs; in a

single series, the membrane not being coiled. No eye spots. Collar with ventral lobes proportionately long and acute, the dorsal lobes small and approximate. Notopodial setæ of usual two types; few. Uncini with beak divergent, nearly horizontal, the "neck" short and the edge of body below bulging much as in *Paralaonome japonica*. Body furrowed along each side just above notopodia excepting anteriorly. Ventral plates sharply limited, elevated; all of abdominal plates bisected by the median longitudinal sulcus excepting the first one, which is entire. Total number of somites, fifty-six, of which eight are thoracic.

Length without branchiæ, 12 mm.; with branchiæ, near 15 mm.

Type—M. C. Z. 2, 175.

Taken among tufted algæ, June 25, 1911 (C. F. Baker).

Pseudopotamilla lampra sp. nov.

In this form the collar membrane is crossed by a series of longitudinal dark stripes, one in line with each radiole, as in *Potamilla colorata*, these narrowing caudad. Branchiæ sometimes mostly dark with light transverse bands. Anterior thoracic segments darkly pigmented both above and below, and also along both sides of tori, and most setigerous papillæ and tori of succeeding regions of body also surrounded in some degree with a pigmented area. Branchial membrane with free dorsal edges produced into two lobes on each side, the two of each pair overlapping, the posterior lobe rounded, the anterior angular with its caudal margin transverse and the other long and oblique. Radioles nineteen pairs, several of these at dorsomesal end of series much reduced. Eyes conspicuous but few, only one, or occasionally two, on a radiole and some radioles wholly lacking them. This species has only seven setigerous thoracic somites. Total number of segments, near ninety-four.

Length, about 28 mm.; with branchiæ, 33 mm.

A note states that this form is pinkish in life. A paratype was taken "in a large white sponge."

Type—M. C. Z. 2, 176.

Pseudopotamilla macrops sp. nov.

While the type of this species includes only the anterior end of the body, its characters seem sufficiently marked for subsequent identification. As in *lampra*, the anterior segments are darkened with purplish brown pigment, especially adjacent to the setigerous papillæ and about the tori, the ventral plates, however, remaining pale. Branchial membrane also pigmented caudally, and the branchiæ transversely banded. Only two eyes on each side are present in the type, a single one each on the second and third radiole from the dorsal end of the series. These eyes are exceptionally large and prominent, much larger than in any of the other species here recorded, embracing practically the entire width of the stalk. The free dorsal edges of the branchial membrane nearly straight, each with only a very slight angulation near its anterior end, not being truly lobate. Nine pairs of radioles. Minor dorsal lobes of collar prominent, produced well forward, curving a little mesad distally, the mesal edge reflected down the dorsal groove as usual.

Width, .75 mm. Length of branchiæ, 2.5 mm.

Type—M. C. Z. 2, 177.

Pseudopotamilla scotia sp. nov.

Differing from the other species here described in having nine setigerous thoracic somites. Anterior somites of thorax darkened above, down the sides on both sides

of the tori and also more or less ventrally with purplish brown pigment. Processes or lobes on free edge of branchial membrane above almost of same form as in *P. lampra* and similarly overlapping. Nineteen pairs of branchial radioles. No eyes. Ventral lobes of collar prolonged, subacute, not overlapping. In the dorsal fasciæ of the ordinary thoracic somites the dorsal setæ are arranged mostly in more or less single, curved, longitudinal series, the clavate ventrals being arranged in two vertical series at right angles to the line of the dorsals. Pennoned setæ of the uncinigerous tori very prominent. Only a few of the most anterior abdominal segments present in type.

Greatest width, 2 mm. Length of branchiæ, 4 mm.

Type—M. C. Z. 2, 178.

Taken in a large white sponge.

SERPULIDÆ

Eupomatus intereans sp. nov.

This species is separated from *E. uncinatus* (Philippi) with some hesitation since specimens of the latter are not at hand for direct comparison. It would seem, however, to be clearly different, to judge from Ehler's figure, in the form of the uncini. These are much broader (i.e., at right angles to the dental line), the base projecting conspicuously but not forming an angulate shoulder as in *E. gracilis*, being nearly evenly and rather broadly rounded. The teeth are mostly seven in number, the end below the last of these set off as usual, rounded. The upper collar setæ coarse, with two teeth or spurs at base of the slender tip, these commonly more or less unequal in size. Branchiæ thirteen pairs. Operculum in general as in *uncinatus*; width of principal expansion 1.25 mm.; the latter even, by narrowing into the stalk, the rim with thirty-eight projecting acute teeth or serrations which are straight or very nearly so, not at all uncate as in *uncinatus* in which they are also fewer (thirty). Inner crown of eleven spines each tapered evenly to an acute tip and bent in abruptly toward the center above, the proximal portion being erect and ordinarily parallel with the others. No process or series of processes detected within this crown, the base from which these arise being evenly concave on its distal surface and convex on the proximal. Spines of the inner crown dark brown proximally as is the entire basal plate from which they arise, the remaining part of spines light brown. Operculum proper nearly black below teeth on proximal surface of the expansion and on adjacent part of stalk the remaining part of which is white; distal surface of funnel pale. Branchiæ and body in general pale, unmarked or some of the branchiæ with a blackish mark on stalk toward distal end. Thoracic setigerous somites seven. Abdominal segments, ninety.

Type—M. C. Z. 2, 178.

Length exclusive of branchiæ, 20 mm.; to end of operculum, about 24 mm. Width, 1.5 mm.

The Nervous System of Caecum Californicum

WILLIAM A. HILTON

Specimens of this little gastropod mollusc from 2 to 3 mm. in length were the material for the study. Specimens were fixed and sectioned whole and a few good series were obtained.

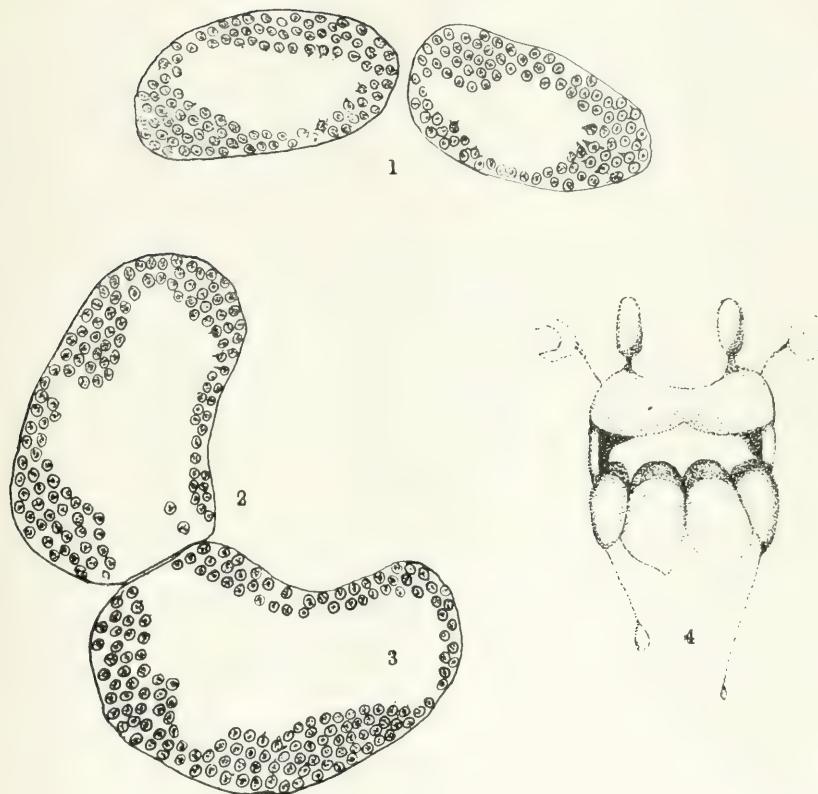
It seems rather remarkable that so small a species should have such a high organization of the nervous system. The ganglia are large in proportion to the size of the animal and well developed. In all cases the exact limits of the nerves and connectives were not determined, but the chief ganglia were easily found.

Quite well towards the head end a pair of buccal ganglia were found, these were small, widely separated and possessed only a few nerve cells. At about this level in cross sections the eyes make their appearance, one on each side. They are simple, quite large and well provided with pigment. Below the level of the eyes and the buccal ganglia, on the dorsal side of the esophagus, the much larger cerebral ganglia make their appearance. These probably are connected with the eyes but the connections were not clearly seen in the sections. The cerebral ganglia are closely united along the middle line. They occupy more than one half the diameter of the entire animal. The more caudal ends of these ganglia separate and run down, a little lateral to the esophagus.

Below the esophagus and a little below the chief level of the cerebral ganglia, a region of more ventral masses of nerve tissue is reached. There are two ganglia on each side, a lateral pair somewhat smaller than the more ventral. The lateral are the pleural and the ventral are the pedal ganglia. The pedal ganglia are closely pressed against each other in the middle line, but not fused, they are much larger than any of the other ganglionic pairs and of a more complicated cell and fibrous structure.

Beyond the region of large ganglia and slightly farther towards the other end of the animal, on the right side, a small visceral ganglion makes its appearance. Farther down on the left side a much smaller group of cells seems to indicate another ganglion of the viscera.

(Contribution from the Zoological Laboratory of Pomona College)



Explanation of Figures

Fig. 1 Camera lucida sketch of cerebral ganglia of Cæcum. The dorsal side is up. X300.

Fig. 2. Left pleural ganglion of Cæcum. X300.

Fig. 3. Left pedal ganglion of Cæcum. X300.

Fig. 4. Reconstruction from Cæcum, showing position of eyes and ganglia viewed from the ventral side. X70.

Amphipods from Laguna Beach

The following list is from the collections of 1917, or that part of it sent to the U. S. Nat. museum for determination.

Aruga oculata Holmes. L. 6 mm., white with red on the head. From algæ. Another white specimen of 8 mm. Dredged at 10 f.

Paraphoxus sp. L. 9 mm. Light colored.

Ipiplateia sp. Red. L. 10 mm.

Lilljeborgia brevicornis Bruz. One specimen dredged Aug. 28. Head white upper half, lower half pink. Lower part of body pink, upper white. L. 6 mm. Another head end of body red, caudal end white. L. 4 mm. Dredged Aug. 11 and Sept. 17th.

Tiron sp. Light colored L. 9 mm.

Elasmopus brasiliensis Dana? L. 6 mm., yellow, brown eyes. Line on back.

Melita quinquedentata Shoem. L. 6.5 mm. Tide pools Aug. 29.

Allorchestes sp. immature. One lot pale green, red antennæ, L. 3.5 mm. One red L. 10 mm. One from holdfasts brown and red L. 6 mm.

Hyalella azteca Sauss. Brown green, 3.5 to 4 mm.

Hyale sp. One red, L. 4 mm. One dark L. 6.5 mm. One pink-brown from sulphur sponge. L. 7 mm. One rose on back, ringed with white. One yellow green back, L. 5.5 mm. One yellow, pink antennæ, holdfast L. 11 mm. One brown from algæ L. 5 mm. One rose brown L. 6 mm.

Orchestoidea corniculata Stout. Green grey, bluish antennæ L. 14 mm.

Lembos sp. bands on body. L. 6 mm. From holdfasts.

Microprotopus sp. Bands on body L. 6 mm.

Photis californica Stout. Bands on body. Holdfasts.

Neophotis inequalis Stout. Brown and red. L. 6 mm. Holdfast.

Amphithoe corallina Stout. Yellow, green antennæ. L. 8 mm. Another mottled white and black L. 10 mm. Another brown white legs two white spots on the sides. One with green eggs L. 9 mm.

A. vaillantii H. Lucas. Bright Red, L. 13 mm. Dredged 10 f. Aug. 17.

A. rubricata Montagu (?) Brownish green, yellow spots on sides Aug. 12, 1915.

Amphithoe sp. Pink, read antennæ, L. 11 mm.

Amphithoe Yellow, pink antennæ. Holdfast.

W. A. H.

(Contribution from the Zoological Laboratory of Pomona College)

JOURNAL OF
ENTOMOLOGY AND
ZOOLOGY

VOLUME X, 1918

PUBLISHED QUARTERLY BY THE
DEPARTMENT OF ZOOLOGY OF POMONA COLLEGE
CLAREMONT, CALIFORNIA, U. S. A.

CONTENTS OF VOLUME X

Volume X, Number 1

List of Spiders from the Claremont-Laguna Region, 1.
Johnson, Charlotte; Ledig, Ruth
Tentative List of Hemiptera from the Claremont-Laguna Region, 3.
Chamberlin, Ralph V.
Four New Western Diplopods, 9.
Hilton, William A.
The Central Nervous System of a Cumacean, 12.
Johnson, Ivan
Land Molluscs Near Claremont, 14.
Molluscoidea at Laguna Beach, 15.
Laguna Beach Summer School, 1918, 17.

Volume X, Number 2

Walden, Jerome
Preliminary List of Claremont-Laguna Orthoptera, 21.
Johnson, Charlotte; Ledig, Ruth
Early Specimens of Hymenoptera from the Claremont-Laguna Region, 23.
Sturgis, Walter
Claremont-Laguna Diptera from the Collections of the Department of Zoology of Pomona College, 27.
Parker, R. R.
A New Species of *Sarcophaga* from California, 32.
Hilton, William A.
Connections Between Nucleus and Cytoplasm, 34.
Crabs Taken at Laguna Beach in the Summer of 1916, 36.

Volume X, Number 3

Myers, Lea
Coleoptera from the Claremont-Laguna Region, 43.
A List of Some Additional Shrimp Like Crustacea from Laguna Beach, 54.
Hilton, William A.
Central Ganglia of Some Decapod Crustacea, 55.
Shaw, M.
Some Amphipods Collected During the Summer of 1916 at Laguna Beach, 57.
Isopods from the Claremont-Laguna Region, 58.

Volume X, Number 4

Nininger, H. H.; Bean, A. M.
Coelenterates from Laguna Beach, 59.
Notes on Annelids Collected During 1917 at Laguna Beach, 60.
Some Chitons Collected During the Summer of 1917, 63.
Nininger, H. H.
A Cumacean from Laguna Beach, 64.
Bean, A. M.; Staples, Harry
A Parasitic Copepod Found at Laguna Beach, 56.
Hilton, W. A.
Notes on the Central Nervous Nervous System of Holothurians, 66.
Grow, W. L.; Darsie, D. L.
Notes on Flat Worms at Laguna Beach, 68.
Branchiostoma *Californiense* Gill, 68.
Hilton, William A.
Further Observations on the Mountain Sheep of the San Gabriel Range, 69.
Scorpions from the Claremont-Laguna Region, 70.
Caldwell, J.
Blepharipoda Occidentalis, 71.
Staples, Harry
Serolis Carinata, 72.
Grow, W. L.
Notes on Sponges at Laguna Beach, 73.
Hilton, W. A.
The Central Nervous System of a Long-armed Serpent Star, 75.
Dolichoglossus Pusillus, 76.
Hilton, W. A.
Pycnogonids Collected During the Summer of 1917 at Laguna Beach, 77.
Some Echinoderms of Laguna Beach, 78.
Darsie, D. L.
A List of Odonata Chiefly from Laguna Beach, 79.
White, H. C.
A List of Small Mammals from the Claremont-Laguna Region, 80.

INDEX TO VOLUME X

Amphipods, 57.
Annelids, 60.
Bean, A. M., 59.
Blepharipoda occidentalis, 71.
Branchiostoma, 68.
Caldwell, J., 71.
Central nervous system, 55, 75.
Chamberlin, R. V., 9.
Chitons, 63.
Coelenterates, 59.
Coleoptera, 43.
Cephalopod, parasitic.
Crabs, 36.
Crustacea, 36, 54, 55, 57, 58.
Cumacean, 64, 72.
Darsie, D. L., 68, 79.
Diplopods, 9.
Diptera, 27.
Dolichoglossus, 76.
Echinoderms, 78.
Flat worms, 68.
Grow, W. L., 68, 73.
Hemiptera, 3.
Hilton, W. A., 12, 34, 55, 66, 69, 75.
Holothurians, 66.
Hymenoptera, 23.
Isopods, 58.
Johnson, C., 23.
Johnson, I., 14.
Laguna Beach Summer School, 17.
Ledig, R., 3.
Mammals, 80.
Molluscs, 14.
Molluscoida, 15.
Mountain sheep, 69.
Myers, Lea, 43.
Nininger, H. H., 59, 64.
Odonata, 79.
Orthoptera, 21.
Parker, R. R., 32.
Pycnogonids, 77.
Scorpions, 70.
Serolis carinata, 72.
Shaw, M., 57.
Spiders, 1.
Sponges, 73.
Staples, Harry, 72, 65.
Sturgis, W., 27.
Walden, J., 21.
White, H. C., 80.

The Journal of Zoological Research

Edited by

WALTER E. COLLINGE, M. Sc., F. L. S., F. E. S.

The Gatty Murine Laboratory

The University, St. Andrews, Scotland

The subject matter is strictly confined to original zoological research—systematic and anatomical. Fully illustrated by lithographic plates and text figures.

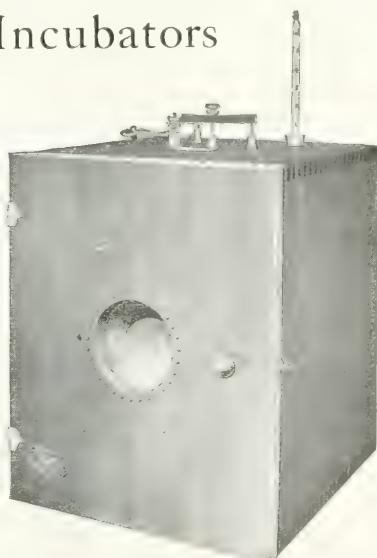
Each volume will consist of 4 parts, price \$5.

All subscriptions should be forwarded to

Messrs. Dulau & Co., Ltd.

37 Soho Square, London, W., England

GRIFFITH Incubators



A simple, well constructed bacteriological incubator

GAGE—The Microscope

An Introduction to Microscopic Methods and to Histology

By SIMON H. GAGE.

Twelfth Edition. Entirely rewritten, and with many new illustrations.

Price, postpaid, \$3.00.

This work aims to give help to everyone who uses the microscope, whether he is a beginner or an advanced worker.

COMSTOCK—A Manual for the Study of Insects

By JOHN HENRY COMSTOCK, Professor of Entomology in Cornell University, and ANNA BOTSFORD COMSTOCK, member of the Society of American Wood-Engravers. 8vo. cloth, IX.+701 pages, 797 figures in the text, and six full page plates. Nearly all of the figures were engraved especially for this work. Postpaid \$4.07; net \$3.75.

This hand-book is designed to meet the needs of teachers in the public schools and of students in high schools and colleges.

NEEDHAM—General Biology

A book of outlines and practical studies for the general student

By JAMES G. NEEDHAM, Professor of Limnology and General Biology in Cornell University. Cloth 8vo. XIV.+542 pages; 288 figures, mostly original. Postpaid \$2.00.

This book is expressly designed to help the general student obtain a comprehensive grasp of the principles of biology.

NEEDHAM & LLOYD—The Life of Inland Waters

A Text-Book of Freshwater Biology

By JAMES G. NEEDHAM, Ph.D., Professor of Limnology and General Biology in Cornell University, and JOHN T. LLOYD, A.B., Assistant in Limnology in Cornell University.

This book is a broad presentation of the field of fresh-water biology, primarily in its scientific aspects, also in its relation to commercial, civic, aesthetic and public health interests of man. There is no book in the English language covering the field. Copiously illustrated with photographs from Nature. 438 pages; 244 figures. Price \$3.00.

GAGE—Optic Projection

By SIMON HENRY GAGE, Professor Emeritus of Histology and Embryology in Cornell University, and Henry Phelps Gage, Ph. D.

This work of over 700 pages and with over 400 figures is of especial interest to workers in all fields of Biology in that it deals especially with the use of the Projection Microscope for demonstrations and for drawing. It also gives the fundamental principles of all the forms of projection. A 16-page circular will be sent on request. Postpaid, \$3.00.

RILEY—Handbook of Medical Entomology

By WM. A. RILEY, Ph. D., Professor of Insect Morphology and Parasitology in Cornell University and O. A. JOHANNSEN, Ph. D., Professor of Biology in Cornell University.

A concise account of poisonous, and disease-carrying insects and their allies, including descriptions and illustrations of the principal species, with keys for their determination, and method of control. Bound Library Buckram, medium 8vo. Nearly 375 pages. Price \$2.00 net.

Send for Descriptive Circular

The Comstock Publishing Company

Cornell Heights, Ithaca, N. Y.

THE "ALL GLASS MOUNT"

for *Lepidoptera* and other insects



Odontolabis wollastoni, Java

We are able at last to offer our customers an all glass mount that we believe comes nearer to meeting the requirements of museums and private collectors than any previously put on the market.

No cut can properly show this mount, which must be seen to be appreciated. Write for Circular 192, which describes fully what we are offering.

When in need of Entomological supplies remember that we have the best insect pins on the market and that our hand made Schmitt insect boxes with three ply tops and bottoms are unsurpassed. Catalogue No. 33 free on application.

Prompt shipments can be made from our large stock of United States and exotic insects of all orders. We also prepare 150 different metamorphoses of beneficial and injurious insects. Pupae now on hand are listed in circular No. 198. Other circulars and price lists free upon request.

Ward's Natural Science Establishment
84-102 College Ave. Rochester, N. Y.

Entomological News

A forty-eight page illustrated magazine, published monthly except August and September, devoted to the study of INSECT LIFE. It contains a list of the titles of the current Entomological Literature, and also articles by the leading Entomologists in the United States and Canada. Valuable information for the beginner, the economic entomologist and the systematist.

To new subscribers, \$1.90; Renewals, \$2.00; payable in advance.
Single copies 25 cents. Address

ENTOMOLOGICAL NEWS
1900 RACE STREET, PHILADELPHIA, PA.

CLASS WORK MATERIAL

CAN BE PROCURED AT ANY TIME OF
THE YEAR FROM

C. S. BRIMLEY, Zoologist

1135 Newberne Avenue

RALEIGH, N. C., U. S. A.

Twenty-one years' experience

Price List on Application

The Journal of Parasitology

A Quarterly Devoted to Medical Zoology

This journal will be a medium for the prompt publication of briefer papers and research notes on animal parasites. Emphasis laid on the morphology, life history and biology of zooparasites and the relations of animals to disease.

Subscription, \$2.00 a Volume

Managing Editor, HENRY B. WARD;

Univ. Illinois, Urbana, Illinois

Do Business by Mail

It's profitable, with accurate lists of prospects. Our catalogue contains vital information on Mail Advertising. Also prices and quantity of 6,000 national mailing lists, 99% guaranteed. Such as:

War Material Mfrs.	Wealthy Men	Fly Paper Mfrs.
Cheese Box Mfrs.	Ice Mfrs.	Foundries
Shoe Retailers	Doctors	Farmers
Tin Can Mfrs.	Axle Grease Mfrs.	Fish Hook Mfrs.
Druggists	Railroad Employees	Feather Duster Mfrs.
Auto Owners	Contractors	Hotels

Write for this valuable reference book.

Ross-Gould, 1027H Olive Street, St. Louis.

ROSS-GOULD
Mailing
Lists St. Louis

Pomona College

Located in one of the most healthful and beautiful parts of the west coast. The mountains reach an elevation of ten thousand feet within a few miles of the college and these with the nearby ocean afford many special advantages for the study of things not in books. Special advantages are afforded by the fact that the college limits its attendance, the freshman class being restricted to two hundred applicants. The success of the college is particularly indicated by the large proportion of the graduates who proceed to advanced work in the large universities. In addition, well-manned departments of music and art afford exceptional advantages.

For further information, address

SECRETARY OF POMONA COLLEGE
Claremont, California

